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Ownership Structure, Board of Directors and Firm Performance: Evidence from Taiwan

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Purpose

Using a dataset of listed firms domiciled in Taiwan, the main aim of this paper is empirically assess the effects of ownership structure, board of directors on firm value.

Design/methodology/approach

Using a sample of Taiwanese listed firms from 1997 to 2015, the study uses a panel estimation to exploit both the cross-section and time-series nature of the data. Furthermore, a 2SLS regression model is used as robustness test to mitigate the endogeneity issue.

Findings

Our main results show that the higher the proportion of independent directors, the smaller the board size, and together with a two-tier board system and no CEO duality, the stronger the firm's performance. With respect to ownership structure, block-holders' ownership, institutional ownership, foreign ownership and family ownership, are all positively related to firm value.

Practical implications

Although the Taiwanese corporate governance reform concerning the independent director system which is mandatory only for newly-listed companies is a successful, the regulatory authority should require all listed companies to appoint independent directors to further enhance the Taiwanese corporate governance.

Originality/value

First, unlike much of the previous literature on western developed countries, this study examines the effects of corporate governance mechanisms on firm performance in a newly-industrialised country, Taiwan. Second, while a number of studies use a single indicator of firm performance this study examines both accounting-based and market-based firm performance. Third, this study addresses the endogeneity issue between corporate governance factors and firm performance by using two stage least squares (2SLS) estimation, and details the econometric tests for justifying the appropriateness of using 2SLS estimation.

Ownership Structure, Board of Directors and Firm Performance: Evidence from Taiwan

1. Introduction

Poor corporate governance has been cited as one of the major reasons that led to the global financial crisis. Furthermore, prior to a number of corporate debacles, corporate governance was not considered as an important issue in many jurisdictions outside the US and Europe. In Taiwan, corporate governance became a major and controversial issue only at the beginning of the 21st century when the Taiwanese authorities started to introduce and implement a series of corporate governance reforms. These reforms are aimed at strengthening Taiwan's corporate governance, and amongst others include the amendment of the Company Act, the Securities and Exchange Act and other related regulations, the introduction of an independent director system and audit committee, and the promotion of shareholders' rights. Using a dataset of listed firms domiciled in Taiwan, the main aim of this paper is empirically assess the effects of ownership structure, board of directors on firm value.

The link between corporate governance and firm performance is important in formulating efficient corporate management and public regulatory policies. However, prior literature focuses mainly on the corporate governance practices in the UK, US and other western developed countries (e.g., Cavaco *et al.*, 2016; Dahya and McConnell, 2007; Wintoki *et al.*, 2012; Yermack, 1996). However, elsewhere, particularly in Asia, firms operate with a different culture and in a distinctive legal and institutional framework, which may have a material effect on corporate governance-firm performance relationships (Piesse *et al.*, 2007). Although some studies also look at new growing economies (e.g. Mak and Kusnadi (2005) in Malaysia and Singapore; Cho and Kim (2007) and Black *et al.* (2015) in Korea), the focus of this research is on Taiwan, which is a newly-industrialised economy that has developed at an impressive rate, and which has a distinctive corporate governance framework such as the supervisory system that is different from most countries. In addition, it has now been several years since the corporate governance reforms were introduced in Taiwan in early 2002. Accordingly, since these reforms which require public companies to improve their corporate governance have now been enforced for a period of time, it is a valuable research agenda to investigate whether the new policies are making Taiwanese public companies perform better.

We use a dataset from Taiwan which provides a suitable background as a newly-industrialised market for our empirical analysis to examine the effects of corporate governance on firm performance. First, as an internal governance mechanism, the board of directors plays an important role in monitoring the management and reducing the agency problem between managers and shareholders (Drakos and Bekiris, 2010), and hence may improve firm performance (Cho and Kim, 2007; Kiel and Nicholson, 2003; Setia-Atmaja *et al.*, 2009; Weir *et al.*, 2002). In particular, we assess the impact of board characteristics (i.e., the proportion of independent directors and independent supervisors, board size, and role duality) on firm performance. Second, we focus on the external governance mechanism of ownership structure (i.e., block-holders' ownership, institutional ownership, foreign ownership and family ownership), which may also display considerable change after the corporate governance reform, and thus might be another determinant of firm performance (Agrawal and Knoeber, 1996; Demsetz and Villalonga, 2001; Dwivedi and Jain, 2005; Piesse *et al.*, 2007). Our main results show that the higher the proportion of independent directors, the smaller the board size, and

together with a two-tier board system and no CEO duality, the stronger the firm's performance. These results are consistent with Mak and Kusnadi (2005), Cho and Kim (2007), Guest (2009), and Drakos and Bekiris (2010). With respect to ownership structure, in line with Filatotchev *et al.* (2005), Maury (2006), Andres (2008), and Bonilla *et al.* (2010), block-holders' ownership, institutional ownership, foreign ownership and family ownership, are all positively related to firm value.

This study contributes to the corporate governance literature in several ways. First, unlike much of the previous literature on western developed countries (e.g., Andres, 2008; Bhagat and Black, 2001; De Andres *et al.*, 2005), this study examines the effects of corporate governance mechanisms on firm performance in a newly-industrialised country, Taiwan. Second, while a number of studies use a single indicator of firm performance (e.g., Dahya and McConnell, 2007; Wintoki *et al.*, 2012; Yermack, 1996), this study examines both accounting-based and market-based firm performance. Third, this study addresses the endogeneity issue between corporate governance factors and firm performance by using two stage least squares (2SLS) estimation and details the econometric tests for justifying the appropriateness of using 2SLS estimation.

The remainder of this paper is structured as follows. Section 2 provides a discussion of corporate governance in Taiwan. Section 3 presents, in addition to the hypothesis development, the literature as to whether corporate governance mechanisms have an impact on firm performance. Section 4 explains the methodological aspects being used in the current study as well as discussing the variables used in developing the hypotheses. Section 5 reports our main findings, analyses of the statistical methods applied to the sample data, and the results of a variety of robustness tests. Finally, section 6 concludes the paper.

2. Institutional Setting: Corporate Governance in Taiwan

Corporate governance became a major and debatable issue in Taiwan only at the beginning of the 21st century when the Taiwanese authorities, having learnt the lessons from the Asian financial crisis of 1997 as well as many corporate scandals around the world, started to introduce and implement a series of corporate governance reforms. Due to the considerable attention on public companies, the reform laid emphasis on the improvement of the monitoring function that prevents self-dealing and deceptive misconduct by boards of directors and management (2009). These reforms, aimed at strengthening Taiwan's corporate governance, and including amongst others the amendment of the Company Act, Securities and Exchange Act and other related regulations, the introduction of an independent director system[1] and an audit committee, and the promotion of shareholders' rights, were initiated in early 2002 by the Securities and Futures Commission (SFC), the predecessor of the Financial Supervisory Commission (FSC), and were co-sponsored by other official institutions.

As a result of a series of reforms, there have been two types of corporate governance structure for public companies in Taiwan since January 2007. The first type is the traditional existing board structure as required by the Company Act, which is based on the German civil law. Following the German system, the board structure of a Taiwanese company is a two-tier

[1] Effective from February 2002, companies that apply for initial public offerings on the Taiwan Stock Exchange (TWSE) are required for the first time to appoint at least two independent directors, which is perhaps the most significant change of Taiwanese corporate governance framework. However, this regulation is not applied to existing listed companies, i.e. it is not mandatory for them to choose to appoint independent directors.

structure, which consists of a board of directors and supervisors[2]. The second type of board structure in Taiwan is a one-tier system as suggested by the Securities and Exchange Act, which is composed of a board of directors and an audit committee. The audit committee, consisting solely of three or more independent directors with at least one of them being specialized in accounting or finance, is organised in lieu of the board of supervisors.[3] In summary, since the amendment to the Securities and Exchange Act in 2006, non-public companies still continue with the traditional two-tier board structure as required by the Company Act. As regards to public companies, if not mandated by the competent authority to host independent directors or to set up an audit committee, they have the alternative of selecting their own internal corporate structure.[4]

In Taiwan, the majority of firms are in the form of small and medium-sized enterprises (SMEs). The board of directors in SMEs tends to be family dominated, implying that companies in Taiwan have few outside directors who are not members of the family or business associates. As for listed companies, family control is still a dominant characteristic, and Yeh *et al.* (2001) report that 51.4% of Taiwanese listed companies are family controlled. Faccio *et al.* (2001) find that families with control/voting greater than their cash flow rights tend to expropriate wealth in East Asia. Similarly, in Taiwan, Yeh and Woidtke (2005) report that the average control rights of the largest shareholders are 30.33%, whereas the average cash flow rights are only 21.68%. Thus this discrepancy (an excess control of 8.66%) provides an incentive for controlling shareholders to expropriate wealth by seeking private interests at the expense of minority investors (Shleifer and Vishny, 1997). In recent years, due to the guidance of the government policy and related regulations, and the considerable transformation of industry structure from labour-intensive to high-tech, there has been a trend towards separation of ownership and control although the discrepancy still exists.

According to the report of Investors Structure in terms of Trading Value on TWSE Market prepared by the Securities and Futures Bureau of the FSC, institutional investors constituted 43.2% of the total trading value in December 2015, whilst individual investors constituted the major portion of 56.8%, implying that individual investors are the main participants in the Taiwan stock market. Due to their extremely small shareholdings, individual investors often renounce their voice in company operations, which leads to neglect in enhancing corporate governance by the listed companies. Coffee (1991) argues that institutional investors are more active and have greater needs for better corporate governance. However, in Taiwan, due to restrictions in the shareholding limit and holding period, the institutional shareholders play a more inactive role in corporate governance than those in the developed countries where the institutional investors actively promote the importance of corporate governance (Admati *et al.*, 1994; Bathala and Rao, 1995).

Taiwan opened its securities market for foreign investment in three stages. In 1982 foreign investment in the securities market was allowed indirectly through investment funds only. In 1990 foreign institutional investors were allowed to invest directly in the securities market and in 1996 the Taiwan securities market was opened for all foreign institutional and individual investors. In the Taiwanese market, foreign investors' ownership is lower than that of domestic investors, but their trading actions dramatically affect the investment decisions of domestic investors through their ability to monitor corporate strategy, capital usage and personnel (Chen *et al.*, 2009). In addition, the media regularly report that the stock price performance is

[2] In this type, companies can be further divided into two groups: companies with independent directors and companies without independent directors.
[3] See Article 14-4, Paragraphs 1 and 2, of the Securities and Exchange Act.
[4] See Article 14-2, Paragraph 1, of the Securities and Exchange Act.

positively correlated with the level of foreign ownership. Consequently, due to their great influence on Taiwan's capital markets, foreign investors play a critical role in improving Taiwanese firms' corporate governance.

3. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

Board Characteristics and Firm Performance

With regard to board independence, agency theory conjectures that outside directors would carry out their tasks to monitor top management because they have incentives to develop reputations in decision control (Fama and Jensen, 1983), and therefore the probability of collusion and expropriation of shareholder wealth by top management might be lowered with a greater proportion of outside directors on the board, which would then minimise the agency costs (Fama, 1980). In addition, prior studies document that independent directors improve the quality of financial statements (Beasley, 1996; Chen *et al.*, 2007; Cornett *et al.*, 2008; Peasnell *et al.*, 2005). Moreover, previous literature points out that outside-dominated boards are more likely than inside-dominated boards to make better decisions in a variety of contexts, such as replacing CEOs in response to poor performance (Weisbach, 1988), resisting demands for greenmail payments (Kosnik, 1987), and making better acquisition deals (Byrd and Hickman, 1992; McDonald *et al.*, 2008). However, findings to date on the relationship between board independence and firm performance or value in developed markets (e.g., US and UK) are still mixed.

As regards the positive effect of board independence on firm value, Baysinger and Butler (1985) indicate that firms with a higher proportion of independent directors have a superior accounting performance record, by using a sample of 266 major US business corporations over the period 1970–1980. Rosenstein and Wyatt (1990) examine the effect of the appointment of outside directors on shareholder wealth by using a sample of 1,251 announcements from the Wall Street Journal and CRSP over the 1981–1985 period, and find that the addition of an outsider director increases firm value. Similarly, Dahta and McConnell (2005) also find that appointing outside directors is directly related to stock price reactions in the UK. In addition, Chung *et al.* (2003) argue that outside directors affect firm performance positively through their ability to provide effective monitoring activities. Dahya and McConnell (2007) examine the association between changes in board composition and firm performance in the UK from 1989 to 1996. Their results reveal that firms which conform to the Cadbury Report recommendation to have at least three outside directors show an improvement in operating performance. In contrast, however, some studies find no significant explanatory power of board independence on firm performance (Dahya *et al.*, 2016; Fosberg, 1989; Hermalin and Weisbach, 1991; Klein, 1998; Lefort and Urzúa, 2008; Mehran, 1995; Prevost *et al.*, 2002; Ramdani and van Witteloostuijn, 2010), and yet others even report a negative relationship between board independence and firm performance (Agrawal and Knoeber, 1996; Bhagat and Black, 2001; Cavaco *et al.*, 2017; Kiel and Nicholson, 2003; Mangena *et al.*, 2012; Yermack, 1996; Zhou *et al.*, 2018).

Unlike the inconclusive empirical results in the developed markets, evidence in newly-developed markets and developing markets is more consistent. For example, using a sample of 1,834 observations over the period 1999–2002, Choi *et al.* (2007) investigate the valuation impacts of independent directors in Korea in the aftermath of the Asian financial crisis, and indicate that the effect of independent directors on firm performance is significantly positive. In addition, using a sample of 347 firms in 1999, Cho and Kim (2007) analyse the linkage

between outside directors and firm performance during the governance reform movement undertaken in Korea. The results show that outside directors have a significantly direct impact on firm performance. In their analysis of 799 firms with a dominant shareholder across 22 countries in 2002, Dahya *et al.* (2008) conclude that the association between corporate value and the percentage of independent directors is positively significant, especially in countries with weaker governance. Similarly, using a sample of 157 non-financial Indian companies for the year 2008, Kumar and Singh (2012) report that the proportion of independent directors has a positive but statistically weak effect on firm value.

Based on the results and arguments demonstrated in the prior studies discussed above, agency theorists underline the positive effect of a higher proportion of outside directors on firm performance. Therefore, in accordance with Agency theory and the argument that independent directors bring about a more powerful board in developing markets, we expect that the potential costs of increasing the number of independent directors on the board are less than the potential benefits for the Taiwanese market. That is to say, there is a positive firm performance effect related to the appointment of independent directors for Taiwanese firms, which suggests the following hypothesis:

H1a*: Board independence is positively associated with firm performance.*

In addition to the board of directors, firms in Taiwan have a board of supervisors, functioning in a capacity equivalent to an audit committee as required in other jurisdictions. The primary responsibilities and powers of these supervisors are to investigate and oversee directors' behaviour, audit firms' financial reports, and scrutinize firms' operations at any time. However, independent directors do not have equivalent supervisory powers held by independent supervisors according to the Company Act. The major function of independent directors is to attend the meeting of the board of directors, and supply their expert and independent opinions regarding important corporate activities as listed in Article 14-3 of the Securities and Exchange Act. In addition, unlike independent directors, supervisors may attend the board meeting, but they do not have the right to vote on the board of directors.

The relationship between a two-tier board structure and firm performance for Taiwan-listed firms has not been widely investigated. However, similar to independent directors, supervisors are also important monitors of the firm; hence we expect to find that firms with a two-tier board system outperform those with a one-tier board system. Consistent with this argument, using the largest 250 publicly traded French non-financial firms from 2006 to 2008, Rouyer (2016) documents that a supervisory board is positively correlated with firm performance. In addition, Young *et al.* (2008) find that the more the independent supervisors on the board, the higher the firm performance, by using a sample of 492 firms listed on the Taiwan Stock Exchange for the years 2001 and 2002. Thus, the following hypothesis is proposed:

H1b*: The proportion of independent supervisors is positively associated with firm performance.*

The board of directors is considered as an institution to mitigate the effect of agency problems between the owners and managers (Drakos and Bekiris, 2010). As boards are supposed to be large decision-making groups, size may affect the decision-making process and effectiveness of the board (Dwivedi and Jain, 2005). Lipton and Lorsch (1992) suggest that an ideal board size should be around eight or nine directors, whilst Jensen (1993) indicates that a board size of seven or eight is optimal. The optimal size of the board and its effect on firm performance have been issues of frequent debate over the years, but the literature shows mixed empirical

results. Proponents of small boards argue that smaller boards are more cohesive and effective in decision making (Jensen, 1993), impartial in evaluations of managerial performance (Lipton and Lorsch, 1992), and easier to coordinate but difficult for the CEO to control (Haniffa and Hudaib, 2006; Jensen, 1993). This argument is supported by several empirical studies. For example, Yermack (1996) finds a negative relationship between board size and firm value (as measured by Tobin's Q) in a sample of 452 large US industrial companies over the period 1984–1991. Also, in their study of 460 firms in Singapore and Malaysia for the years 1999 and 2000, Mak and Kusnadi (2005) report an inverse association between board size and firm value.

In addition, De Andres *et al.* (2005) report a negative relationship between firm value and the size of board of directors in a sample of 450 non-financial firms from ten countries in Western Europe and North America for the year 1996. In an analysis of 347 companies listed on the Kuala Lumpur Stock Exchange from 1996 to 2000, Haniffa and Hudaib (2006) find board size to be negatively associated with market performance measures based on Tobin's Q. Similarly, Cheng (2008) uses a sample of 1,252 US firms over the period 1996–2004 to investigate the relationship between board size and the variability of firm performance, and concludes that firm performance is negatively related to board size. Dahya *et al.* (2008) also find a negative correlation of Tobin's Q with board size in a sample of 799 firms from 22 countries in 2002.

Moreover, using a sample of 492 firms listed on the Taiwan Stock Exchange for the years 2001 and 2002, Young *et al.* (2008) reveal that firm performance is inversely associated with board size. In his study of a large sample of 2,746 firms in the UK between 1981 and 2002, Guest (2009) shows that the linkage between board size and firm performance is significantly negative. More recently, Drakos and Bekiris (2010), using a sample of 1,409 firm-year observations for the years 2000 to 2006, document that the relationship between board size and firm performance is inversely significant in Greece. Analysing a sample of 23 Tunisian listed firms over the period 1998–2009, Turki and Sedrine (2012) also find that board size has a significantly inverse impact on firm performance. Additionally, in their study on the top 100 firms in the European Union for the period 2004–2015, Green and Homroy (2018) report an inverse relationship between board size and firm performance.

On the contrary, proponents of large boards argue that they may be valuable to some companies as they provide more monitoring resources (Ramdani and van Witteloostuijn, 2010), bring more experience and knowledge (Adams and Ferreira, 2007; Mangena *et al.*, 2012), and support diversity that helps companies to reduce environmental uncertainties and obtain key resources (Goodstein *et al.*, 1994; Pearce and Zahra, 1992), all of which may enhance firm performance (Choi *et al.*, 2007; Kiel and Nicholson, 2003; Lefort and Urzúa, 2008; Ramdani and van Witteloostuijn, 2010). However, Dahya and McConnell (2007), Wintoki *et al.* (2012), and Delis *et al.* (2017) find no association between board size and firm performance.

Although the empirical evidence on the relationship between board size and firm performance is still inconclusive, Agency theory argues that larger board size increases agency cost and monitors the firm improperly. In addition, Lipton and Lorsch (1992), and Jensen (1993), also suggest that as board size increases beyond a certain point, it affects firm performance in an inverse direction, and leads to a free rider problem among the many board directors. Taken together, the following hypothesis is then proposed:

***H1c**: Board size is negatively associated with firm performance.*

A further board structure control mechanism relates to board leadership or role duality, which exists when a chief executive officer (CEO) also serves as the chairman of the board (COB).

Jensen (1993) indicates that when someone holds these two top important positions simultaneously, internal control mechanisms fail, i.e. the function of the board as a monitor of the CEO is weaker. Similarly, Fama and Jensen (1983) argue that combining the decision management and decision control power lowers a board's effectiveness in monitoring the CEO, which might lead to worse firm performance.

Empirical evidence of the effect of CEO duality on firm performance has yielded conflicting results. Rhoades *et al.* (2001) find that firms with a separation of CEO and COB consistently have higher performance than those that have the two roles combined. Similarly, analysing a sample of 412 Hong Kong listed firms from 1995 to 1998, Chen *et al.* (2005) find a negative association between CEO duality and firm performance. In addition, Haniffa and Hudaib (2006) indicate that board leadership is negatively and significantly associated with accounting performance, using a sample of 347 Malaysian listed companies between 1996 and 2000. Likewise, using a sample of US firms included in the S&P 100 Index over the period 1994–2003, Cornett *et al.* (2008) detect an inverse impact of role duality on firm performance.

In contrast to the studies supporting a negative correlation between CEO duality and firm performance, some empirical studies find no relationship between the dual role of a leadership structure and firm performance (Belkhir, 2009; Dahya and McConnell, 2007; Drakos and Bekiris, 2010; Kiel and Nicholson, 2003; Weir *et al.*, 2002; Wintoki *et al.*, 2012; Young *et al.*, 2008), while others support the notion that firms which combine the roles of CEO and the chairman of the board outperform those with separated roles (Ahmadi *et al.*, 2018; Al Farooque *et al.*, 2007; Ramdani and van Witteloostuijn, 2010; Tian and Lau, 2001).

Although empirical studies on the role-duality and firm-performance relationship have documented mixed findings, Agency theory argues that a separation of the CEO and COB is important to develop effective monitoring by the board, which may impact positively on firm performance (Dayton, 1984; Ramdani and van Witteloostuijn, 2010). Therefore, it is proposed that the combination of CEO and board chairman positions would lead to a detriment of firm performance, which suggests the following hypothesis:

H1d*: Board leadership is negatively associated with firm performance.*

Ownership Structure and Firm Performance

Ownership concentration (in the form of block-holders' ownership) is one of the key determinants of corporate governance. The literature documents that the impact of ownership concentration on firm performance ranges from positive to negative. On the one hand, since block-holders can receive a large proportion of firm profits, they have extremely strong incentives to monitor insiders in order to alleviate agency problems (Demsetz and Lehn, 1985; Shleifer and Vishny, 1986). In addition, Jensen and Meckling (1976) suggest that the value of the firm increases with ownership concentration as long as the change in ownership aligns the interests of management and shareholders. Consistent with this view, Claessens and Djankov (1999), using a sample of 706 Czech firms from 1992 to 1997, find that the more concentrated the ownership, the higher the firm profitability. Moreover, Mak and Kusnadi (2005) indicate that there is a positive relationship between block-holders' ownership and firm performance in Malaysia and Singapore. Similarly, using a sample of 347 Malaysian listed companies between 1996 and 2000, Haniffa and Hudaib (2006) suggest that the impact of block-holders' ownership on accounting performance is significantly positive. Cho and Kim (2007) also find a positive relationship between block-holders' ownership and firm performance in Korea. Furthermore, in Taiwan, Young *et al.* (2008) report that firm performance is positively related to block-

holders' ownership. Omran *et al.* (2008) point out that the relationship between ownership concentration and firm performance is significantly positive. Paniagua *et al.* (2018) also document that ownership dispersion is negatively associated with firm performance in their study of a random sample of 1207 companies from 59 countries.

On the other hand, Fama and Jensen (1983) argue that if the ownership concentration increases to such a level that it entrenches the management and prevents takeovers, then firm performance falls. In addition, large shareholders who are forced into voting with management and find it beneficial to collaborate with management might cause poor firm performance due to less effective monitoring and high risk exposure (Brickley *et al.*, 1988; Pound, 1988). Supporting evidence provided by Demsetz and Villalonga (2001) indicates that the higher the ownership concentration, the lower the firm performance in the US. Similarly, Villalonga and Amit (2006) point out that block-holders' ownership is negatively associated with firm performance, in a sample of 508 firms listed on the Fortune 500 over the period 1994–2000. Moreover, using a panel data of 160 Chilean companies from 2000 to 2003, Lefort and Urzúa (2008) show that firm performance is negatively related to ownership concentration. Belkhir (2009) and Ducassy and Montandrau (2015) also reports an inverse impact of block-holders' ownership on firm performance.

Although the findings of empirical research on the impact of block-holders' ownership on the firm performance are mixed, in order to adhere to Agency theory and the argument that shareholders with only small stakes in a corporation fail to monitor management efficiently, we expect that the more the ownership concentration, and hence the stronger the monitoring function, the higher the firm performance. The above argument suggests the following hypothesis:

H2a*: Block-holders' ownership is positively associated with firm performance.*

Admati *et al.* (1994) and Shleifer and Vishny (1997) argue that institutional investors have strong incentives to mitigate managerial opportunism and control managers' exploitation of investors. In addition, Coffee (1991) and Choi *et al.* (2007) suggest that institutional investors may assist independent directors in their monitoring and thereby contribute to firm performance. Consistent with these arguments, McConnell and Servaes (1990) find a direct linkage between institutional ownership and firm performance for US firms. Moreover, Filatotchev *et al.* (2005) show that the relationship between institutional ownership and firm performance is significantly positive, using a dataset of 228 firms listed on the Taiwan Stock Exchange in 1999.

Piesse *et al.* (2007) also use a Taiwanese dataset and find that the higher the institutional ownership, the higher the firm's performance. Similarly, using a sample of 943 firm-year observations for the years 2001 and 2002, Young *et al.* (2008) report that firm performance improves with institutional ownership in Taiwan. Furthermore, analysing a sample of 1,834 Korean firm-year observations from 1999 to 2002, Choi *et al.* (2007) indicate that institutional ownership has a positive impact on firm performance. Omran *et al.* (2008) suggest that firm performance is positively related to institutional ownership, with a sample of 304 firms from four Arab countries over the 2000–2002 period. Lin and Fu (2017) also suggest a positive impact of institutional ownership on firm performance in China for the period 2004–2014. Based on the above arguments, we propose the following hypothesis:

H2b*: Institutional ownership is positively associated with firm performance.*

Dahlquist and Robertsson (2001) argue that the role of foreign investors is similar to that of institutional investors. In addition, foreign investors usually have less connection with insiders than domestic investors, and hence they may monitor insiders more effectively (Chen *et al.*, 2009). Therefore, it is expected that foreign ownership also has a positive impact on firm performance. Supporting evidence is provided by several studies. For example, using a sample of 340 large listed Indian firms over the period 1997–2001, Dwivedi and Jain (2005) find that foreign shareholding is positively associated with firm performance. Moreover, Cho and Kim (2007) indicate that firm performance is directly related to foreign investor ownership, with a sample of 347 firms listed on the Korea Stock Exchange in 1999.

Similarly, Choi *et al.* (2007) document that foreigners have a positive impact on firm performance in Korea, using a sample of 1,834 firm-year observations from 1999 to 2002. Furthermore, Omran *et al.* (2008) work with a sample of 304 firms from four Arab countries for the period 2000–2002, and report that there is a positive relationship between foreign ownership and firm performance. Recently, analysing a sample of Taiwanese firms conducting seasoned equity offerings over the 1991–2002 period, Chen *et al.* (2009) point out that the impact of foreign ownership on post-issue operating performance is significantly positive. Bentivogli and Mirenda (2017) also indicate that foreign ownership has a direct impact on firm performance by using a sample of Italian list firms between 2007 and 2013. The above arguments and empirical findings lead us to the following hypothesis:

H2c*: Foreign ownership is positively associated with firm performance.*

The expected relationship between a family-controlled firm and performance is unclear. On the one hand, families have a powerful incentive to expropriate wealth by seeking private interests at the expense of minority investors (La Porta *et al.*, 1999; Shleifer and Vishny, 1997). Hence, unlike the traditional agency problem between managers and shareholders, the agency conflict between controlling shareholders and minority shareholders might be more prevalent in family-controlled firms (Setia-Atmaja *et al.*, 2009). For example, using a sample of 5,897 financial and non-financial corporations in East Asia and Western Europe, Faccio *et al.* (2001) find that families with control greater than their cash flow rights tend to expropriate wealth. Therefore, family ownership might affect firm performance negatively (Choi *et al.*, 2007; Jaskiewicz *et al.*, 2017; Setia-Atmaja *et al.*, 2009). On the other hand, families also have strong incentives to monitor managers and decrease agency costs since families have usually invested most of their private wealth in the company (Demsetz and Lehn, 1985). In addition, if monitoring activities need knowledge and information about the firm's technology, families might also have an advantage due to their close and lengthy involvement with the firm (Andres, 2008; Filatotchev *et al.*, 2005; Piesse *et al.*, 2007). As a result, a family-controlled firm may provide a competitive advantage and improve firm performance (Anderson and Reeb, 2003). A number of other empirical studies also show that family ownership is correlated with better performance (Bonilla *et al.*, 2010; Carney and Gedajlovic, 2002; Hsu *et al.*, 2018; Joh, 2003; Maury, 2006; Villalonga and Amit, 2006; Wang and Shailer, 2017). When all the evidence is taken together, since the impact of family ownership on firm performance is an empirical issue, the following hypothesis is then proposed:

Although the empirical evidence on the relationship between family ownership and firm performance is still inconclusive, agency theorists argue that family firms need not incur significant agency cost (Schulze *et al.*, 2001). In addition, Villalonga and Amit (2006) suggest that the owner-manager agency problem in nonfamily firms is more costly than the agency problem between family and minority shareholders in founder-CEO firms. Therefore, in accordance with agency theory and the above arguments, we propose the following hypothesis:

***H2d**: Family ownership is positively associated with firm performance.*

4. Research methodology

In order to investigate the hypotheses developed in the previous section, this study uses a dataset of firms listed on the Taiwan Stock Exchange (TWSE) with fiscal year ending on 31st December for the years 1997–2015. Financial statements, stock prices, board characteristics, and ownership structure data are drawn from the Taiwan Economic Journal (TEJ) database. Table 1 provides details about the sample selection process. The preliminary sample size for firms listed on the TWSE from 1997 to 2015 is 12,680. We then exclude 645 observations for firms in the financial, securities and insurance industries, and 186 observations for foreign firms issuing depository receipts in Taiwan, because their regulatory and reporting regimes are considerably different from firms in other industries. We further exclude 625 observations for firms listed less than one year or firms with incomplete financial, stock price and corporate governance data. In addition, we exclude 1,073 observations for firms representing the lowest and highest one percent in the sample (i.e. outliers). The full sample size after this selection process thus consists of 10,151 firm-year observations, an unbalanced panel data of different numbers of firms from 1997 to 2015.

[insert Table 1 here]

Given that our dataset is an unbalanced panel data of different numbers of firms over a 18-year period from 1997 to 2015, we employ the panel estimation to exploit both the cross-section and time-series nature of the data.[5] In addition, we include industry dummy variables to control for industrial effects. Industry Classification Benchmark (ICB) is adopted to categorise our sample firms under nine industries: oil and gas, basic materials, industrials, consumer goods, health care, consumer services, telecommunications, utilities, and technology. Therefore, eight dummies are constructed. Finally, we also use year dummy variables in the model to capture the regulation effect which may affect the outcome variable. The following equation for the industry- and year- fixed effects model (also called a two-way fixed effects model) is specified:

$$\begin{aligned} \mathrm{PERF}_{it} = {} & \alpha_0 + \alpha_1 \mathrm{INDBOD\_R}_{it} + \alpha_2 \mathrm{TIER}_{it} + \alpha_3 \mathrm{BODSIZE}_{it} + \alpha_4 \mathrm{DUALITY}_{it} \\ & + \alpha_5 \mathrm{BLOCKOWN}_{it} + \alpha_6 \mathrm{INSTOWN}_{it} + \alpha_7 \mathrm{FOROWN}_{it} \\ & + \alpha_8 \mathrm{FAMOWN}_{it} + \sum \alpha \mathrm{CONTROLS}_{it} + \varepsilon_{it} \\ i = 1, \dots, N; \; t = 1, \dots, T & \end{aligned} \tag{1}$$

Where $\mathrm{PERF}_{\mathrm{it}}$ is the firm performance, which is measured using both accounting-based measures (i.e., return on assets and return on equity), backward and inward indicators that represent the past results, and market-based measures (Tobin's Q and market-to-book value of

[5] Given our dataset, two potential regression models, i.e., the fixed effects and random effects model can be used in the econometric analysis. Unlike the random effects model which requires that the individual effects are random and uncorrelated with explanatory regressors included in the model, the fixed effects model assumes that the individual heterogeneity is associated with independent variables (Baltagi, 2005). In order to decide whether fixed effects or random effects model is more appropriate for our dataset, we perform the Hausman (1978) specification test where the null hypothesis is that both fixed and random effects are consistent. The result ($\mathcal{X}^2$ = 65.51, p = 0.00) rejects the null hypothesis and leads us to a fixed effects model.

equity), forward-looking indicators that reflect the expected future earnings by the market. Return on assets (ROA) is the ratio of earnings before interest and taxes divided by the book value of average total assets (Cho and Kim, 2007; Klein, 1998; Mangena *et al.*, 2012; Ramdani and van Witteloostuijn, 2010). Return on equity (ROE) is measured as the ratio of net income divided by the book value of average total equity (Baysinger and Butler, 1985; Daily and Dalton, 1992; Ghosh, 2006; Omran *et al.*, 2008; Tian and Lau, 2001). Tobin's Q (Q) is calculated as the sum of the market value of common shares and the book value of total debt divided by the book value of total assets, which is consistent with prior studies (Andres, 2008; Bozec *et al.*, 2010; Choi *et al.*, 2007; Dahya *et al.*, 2008; Young *et al.*, 2008). Market-to-book value of equity (MBVE) is measured as the market value of equity divided by the book value of equity (Al Farooque *et al.*, 2007; De Andres *et al.*, 2005; Filatotchev *et al.*, 2005; Lefort and Urzúa, 2008; Turki and Sedrine, 2012).

The proportion of independent directors (INDBOD_R) is calculated as the ratio of the number of independent directors divided by the total number of directors on the board. An independent director should meet all of the board independence criteria for being independent as stated in Articles 2 and 3 of the Regulations Governing Appointment of Independent Directors and Compliance Matters for Public Companies. The board structure (TIER) is a dummy variable, which equals 1 if the firm's board structure is a two-tier system, and 0 otherwise. Board size (BODSIZE) is measured as the total number of directors on the board. Board leadership (DUALITY) is a dummy variable, which equals 1 if the CEO is also the chairman of the board of directors, and 0 otherwise. Block-holders' ownership (BLOCKOWN) is measured as the proportion of shares owned by the ten largest outside shareholders or shareholders who hold at least 5% of shares outstanding. Institutional ownership (INSTOWN) is measured as the proportion of shares owned by institutional shareholders. Institutional shareholders include both foreign and domestic financial institutions (e.g., investment trust funds, securities dealers). Foreign ownership (FOROWN) is measured as the proportion of shares owned by foreign shareholders. Foreign ownership includes shareholdings owned by foreign individuals and institutions such as asset management firms. Family ownership (FAMOWN) is measured as the proportion of shares owned by family members and other legal entities that are controlled by family members. Family members are relatives who hold positions in top management or on the board (Hsu *et al.*, 2018).

The reason for inclusion of the control variables ($\mathrm{CONTROLS}_{it}$) in the regression models is that it can isolate the impact of other factors affecting firm performance and would highlight the relationship between board characteristics and ownership structure, and firm performance. Firm size (FIRMSIZE) is measured as the natural logarithm of the book value of total assets. Larger firms find it easier to generate funds internally and to gain access to funds from external sources, which can have valuable effects on firm performance (Ng, 2005). However, larger companies are likely to be more diversified, and thus might be subjected to higher agency and bureaucratic costs (Choi *et al.*, 2007; Fama and French, 1992). Therefore, we do not predict a sign for this variable. Growth opportunity (GROWTH) is measured as the ratio of current year sales minus prior year sales divided by prior year sales. Sales growth generally enhances the capacity utilisation rate, which spreads fixed costs over more revenue resulting in higher profitability (Amidu, 2007; Brush *et al.*, 2000). Accordingly, GROWTH is predicted to be positively correlated with firm performance. Leverage (LEV) is measured as the ratio of total debt divided by the book value of total assets. LEV is used to gauge the firm's ability to cope with business downturns. A firm with a high LEV ratio is more easily exposed to the danger of business shocks since it has less ability to repay debt. LEV could be harmful to the firm value because of the accompanying bankruptcy costs and the deterioration of underinvestment issues (McConnell and Servaes, 1995; Myers, 1977). Similarly, according to the pecking order

theory, debt is inversely associated with the profitability of the firm (Myers, 1984; Ng, 2005). Therefore, this study expects LEV to be negatively correlated with firm performance. Dividend payout ratio (DPAYOUT) is calculated by dividing cash dividend per share by earnings per share. Dividend is important to shareholders and prospective investors in showing the profits that a company is making. Arnott and Asness (2003) and Zhou and Ruland (2006) report that high-dividend-payout companies tend to experience strong future earnings growth. In contrast, Amidu (2007) finds a negative association between dividend payout ratio and firm performance (proxied by return on assets). Therefore, no sign is predicted for this variable. Firm age (FIRMAGE) is measured as the number of years that a firm has operated. FIRMAGE is included as a control variable because it is plausible that as the firm matures, it may become more complex, creating more agency problems (Choi *et al.*, 2007; Denis and Sarin, 1999). Therefore, we employ FIRMAGE to control for the maturation effect on firm performance, and expect that firm performance is negatively related to firm age. Product market competition is measured by the Herfindahl-Hirschman Index (HHI) and is calculated as the sum of squares of the market share for each firm in the industry in each year. The lower the HHI, the lower is the industry concentration, and hence the higher is the industry competition. Previous research indicates that high product market competition may ensure that management does not shirk its responsibilities (Machlup, 1967; Pant and Pattanayak, 2010). Pant and Pattanayak (2010) also argue that higher product market competition forces the managers/insiders to focus on high performance. Big-4 audit firm (BIG4) is a dummy variable, which equals 1 if the firm is audited by a Big-4 audit company, and 0 otherwise. Fan and Wong (2005) report that firm value measured by the market-to-book value ratio is positively correlated with the Big 5 auditor, suggesting a Big 5 premium. Therefore, a dummy variable, BIG4, is expected to be positively associated with firm performance. R&D ratio (RD) is calculated by dividing the ratio of R&D expenditure by total sales. Chung *et al.* (2003) and Sher and Yang (2005) find that firms with higher R&D expenditures perform better than those with lower R&D expenditures. However, there is also evidence of a negative relationship between investments in R&D and firm performance (Pearl, 2001). Accordingly, we employ RD as a control variable but do not predict the direction of the linkage between RD and firm performance. Table 1 below provides the definition of the research variables employed in the model.

[insert Table 2 here]

5. Results

Table 3 below reports the descriptive statistics of the research variables used in this study for the full sample. In addition, we present the yearly mean values of the research variables in Table 4 below. With respect to firm performance variables, the results show that the average ROA is 5.26%, the average ROE is 7.18%, the average Tobin's Q is 1.34, and the average market-to-book value ratio (MBVE) is 1.52. Additionally, the mean values of these performance variables show a downward trend from 1997 to 2000 due to the Asian financial crisis and the dot-com bubble, and then an upward trend until the financial "tsunami" in 2008. Given that Taiwan is an export-oriented country, it is plausible that the profitability of most Taiwanese firms is deeply affected by the global economic conditions.

With respect to board characteristics variables, the proportion of independent directors (INDBOD_R) has an average of only 7.74% and a median of 0, indicating that there are still many Taiwanese companies which do not appoint independent directors, consistent with a study using Taiwanese firms by Young *et al.* (2008). As shown in Table 4, the average proportion of independent directors in Taiwan increases over the period, although it is

markedly lower than that in other countries; for example, the percentages are 56%, 41%, 46%, 57% for the US (Boone *et al.*, 2007), UK (Guest, 2008), Australia (Arthur, 2001) and Singapore (Mak and Li, 2001), respectively.

As to the other board characteristics variables, the board structure (TIER) is on average 95.70% with a median of 1, implying that most companies' board structure in the sample is a two-tier structure, consisting of a board of directors and supervisors. As regards the trend, the mean value decreases from 100% in 2006[6] to 79.20% in 2015. In addition, the average number of directors on the board (BODSIZE) is 9.69 (with a minimum of 5 and a maximum of 22), which is smaller than the mean numbers of 11.88 and 12.03 for listed firms in the US reported by Fitch and Shivdasani (2006) and in the UK reported by Andres *et al.* (2005), respectively. The mean number of board size declines from 10.50 in 1997 to 9.63 in 2000, and then remains relatively stable from 2001 onwards. Last but not least, approximately 27.80% of the sample firms' CEOs are also the chairmen of the board of directors (DUALITY). The mean value increases from 21.10% in 1997 to 29.30% in 2015.

In terms of ownership structure variables, the average block-holders' ownership (BLOCKOWN) is 18.21%, with a maximum of 79.81%. The mean value increases from 9.91% in 1997 to 22.36% in 2015. In addition, the average (median) institutional ownership (INSTOWN) is 2.16% (0.37%), which is considerably lower than the mean of 34.16% in the US (Linck *et al.*, 2008). As regards the trend, the mean institutional ownership increases steadily from 1.72% to 3.23% over the period under study. Moreover, the average foreign ownership (FOROWN) is 9%, indicating that foreigners constitute only a small proportion of firm ownership for the sample companies. The mean value trend of foreign ownership shows a downward pattern from 1997 to 2001, and then begins an upward pattern from 2001 onwards. Lastly, based on the definition of this study, the average family ownership (FAMOWN) is 28.58%, with a maximum of 95.56%. The mean value of family ownership remains relatively stable between 26% and 30% over the period.

With respect to control variables, the average firm size (FIRMSIZE, natural logarithm of the book value of total assets) is 15.79 billion NTD (New Taiwan Dollars), the average growth opportunity (GROWTH) is 6.31%, the average debt ratio (LEV) is 37.39%, and the average dividend payout ratio (DPAYOUT) is 40.78%. In addition, the average product market competition (HHI, the sum of squares of the market share for each firm in the industry) is 0.15 (with a minimum of 0.04 and a maximum of 0.93).

[insert Table 3 here]

[insert Table 4 here]

Table 5 reports the results of the Pearson correlation matrix amongst the independent variables used in the regressions for the full sample over the period 1997–2015. The correlation coefficients between all independent variables are small (with a maximum of 0.513), suggesting no multicollinearity problem.[7] The highest correlation coefficient is the correlation

[6] It was not until 2007, when the amendment of Securities and Exchange Act was effective, that listed companies in Taiwan had the option to choose from a one-tier or two-tier board structure.

[7] Multicollinearity may be a problem when the correlation coefficient exceeds 0.80 (Gujarati, 1995). The current study also uses the Variance Inflation Factor (VIF) to double-check for any multicollinearity issue. The largest VIF is for the firm size (FIRMSIZE) (1.78), whereas the lowest VIF is for the growth opportunity (GROWTH) (1.04). As a result, the VIFs vary from 1.04 to 1.78 (with a mean of 1.30, not reported in the table), which are all lower than the critical value of 10. Therefore, the regression models used to test the hypotheses are relatively free from multicollinearity problems.

between the firm size (FIRMSIZE) and the foreign ownership (FOROWN) (r = 0.513, p < 0.01). In addition, the larger the firm size (FIRMSIZE), the larger the institutional ownership (INSTOWN) (r = 0.301, p < 0.01), showing that large firms are more attractive to institutional and foreign investors. Moreover, block-holders' ownership (BLOCKOWN) is positively related to family ownership (FAMOWN) (r = 0.390, p < 0.01), implying that firms with larger block-holders' ownership are also family-dominated. Furthermore, the correlation coefficient between the proportion of independent directors (INDBOD_R) and the board structure (TIER) is negative (r = -0.512, p < 0.01), indicating that firms with a higher percentage of independent directors are more likely to have a one-tier board of directors.

[insert Table 5 here]

Table 6 below provides the fixed effects regression results of firm performance on board characteristics, ownership structure and control variables. The regression results in columns 1 and 2 are based on accounting measures for ROA and ROE, respectively. In terms of board characteristics variables, the coefficient of INDBOD_R is positive and statistically significant at the 1% significance level for both ROA and ROE. The results support Hypothesis 1a and are in line with Cho and Kim (2007), suggesting that board independence does enhance firm performance. Hypothesis 1b is also accepted as the coefficient of TIER is positively and significantly associated with ROA and ROE at the 1% level. These results suggest that firms with a two-tier board system outperform those with a one-tier one. In addition, the coefficient of BODSIZE is negative and significant at the 1% level for both ROA and ROE. Therefore, Hypothesis 1c is supported, indicating that the smaller the board size, the higher the firm performance, which is consistent with Guest (2009). Moreover, the coefficient of DUALITY is also negative and significant at the 1% level for both ROA and ROE, thus supporting Hypothesis 1d. These results are consistent with Haniffa and Hudaib (2006), and Cornett *et al.* (2008), indicating that firms with a combined position of CEO and chairman of the board have a lower performance than those with separate positions.

With respect to ownership structure, the coefficient of BLOCKOWN is positive for both ROA and ROE, but only statistically significant at the 10% level for ROA. Thus Hypothesis 2a is partly supported, indicating that ownership concentration has a kind impact on firm performance among Taiwanese listed firms, consistent with Young *et al.* (2008). In addition, similar to the research of Filatotchev *et al.* (2005), the coefficient of INSTOWN is positive and significant at the 1% for both ROA and ROE. These results support Hypothesis 2b, implying that the institutional ownership has a favourable impact in enhancing firm performance. Moreover, the coefficient of FOROWN is positively and significantly related to both ROA and ROE at the 1% level, thus confirming Hypothesis 2c. The results are similar to those of Chen *et al.* (2009) which also reports the positive impact of foreign ownership on firm value. As to family ownership, the coefficient of FAMOWN also has a significantly positive association with ROA and ROE at the 1% level. These results are in line with those of Andres (2008) and support Hypothesis 2d. Finally, as regards the control variables, we observe that FIRMSIZE, GROWTH, DPAYOUT, and BIG4 are positively correlated with both ROA and ROE, whereas LEV, HHI, and FIRMAGE are negatively associated with both ROA and ROE. In addition, RD is significantly and negatively related to ROE but not to ROA.

The regression results based on market measures (i.e. Q and MBVE) are shown in columns 3 and 4. With regard to board characteristics, the coefficient of INDBOD_R is positive and significant at the 1% level for both Q and MBVE. These results support Hypothesis 1a,

indicating that the higher the proportion of independent directors, the higher the firm performance, which is consistent with the studies of Setia-Atmaja *et al.* (2009), and Choi *et al.* (2007). In addition, the coefficient of TIER is positively and significantly associated with Q and MBVE at the 1% and 5% level, respectively. Therefore, Hypothesis 1b is supported. Moreover, unlike the accounting-based measures, we find that Hypothesis 1c is not confirmed since the coefficient of BODSIZE is positively and significantly related to Q and MBVE at the 5% significance level, suggesting that firms with a large board perform better, which is in line with Lefort and Urzúa (2008). As to board leadership, the coefficient of DUALITY is negative and significant at the 10% level. Therefore, Hypothesis 1d is accepted.

In terms of ownership structure, similar to the results of accounting-based measures, we observe that Hypotheses 2a, 2b, 2c and 2d are all supported as each of the coefficients of BLOCKOWN, INSTOWN, FOROWN and FAMOWN is positive and significant at the 1% level for both Q and MBVE. These results are in line with those of Filatotchev *et al.* (2005), Choi *et al.* (2007) and Andres (2008). Lastly, when we look at the control variables, we find that GROWTH, DPAYOUT, BIG4 and RD are positively correlated with Q and MBVE, whereas FIRMSIZE, LEV, HHI, and FIRMAGE are negatively correlated with both Q and MBVE.[8]

[insert Table 6 here]

Robustness Test

The panel regression results may suffer from the endogeneity problem. In this study, endogeneity of board characteristics and ownership structure variables through firm performance would imply that the panel regression estimates are biased and inconsistent, and therefore cannot be used to make inferences about the causality of the relationship. Accordingly, we use the IV method with a single-equation 2SLS estimation to address the endogeneity issue. The equation being employed to conduct the IV method is the same as equation (1). However, 2SLS estimation may not bring better estimates than panel estimation since it is difficult to find theoretically and empirically appropriate instruments.

Based on the data we have, we use several potential instrumental variables: lagged values of each of endogenous variables and dividend payout ratio (DPAYOUT)[9], which might be correlated with the endogenous regressors (i.e. board characteristics and ownership structure variables), but not with the error terms. First, Setia-Atmaja *et al.* (2009) indicate that dividend payout policy is associated with board size, board independence, block-holders' ownership, and family ownership. Second, in the presence of information asymmetry between managers and external shareholders, dividend payout policy can reduce the costs of agency conflicts by limiting resources available for use at the discretion of managers (Jensen, 1986; Mancinelli and Ozkan, 2006; Short *et al.*, 2002). In addition, larger dividend payments might also be attractive to shareholders.

The appropriateness of the chosen instrumental variables is then examined by the two specification tests: the test of weak instruments (i.e., relevance condition: the instrumental variables should be correlated with the endogenous regressor) and over-indentifying restrictions (i.e., exclusion condition: the instrumental variables should be uncorrelated with

[8] Furthermore, we re-estimate all regressions by splitting the sample period into pre and post-financial periods. The untabulated results are qualitatively similar as compare to the full sample period.

[9] Other studies that have used lagged values as instruments for current values in an instrumental variables framework include Yermack (1996), Guest (2008), and Chen and Al-Najjar (2012).

the error term). The results of these tests are presented in the lower part of Table 7. First, the relevance condition is checked by the results from the first-stage linear regression of 2SLS estimation with the value for the Cragg-Donald *F*-statistic on the excluded instruments. The lower part of Table 7 shows that the Cragg-Donald *F*-statistic in which the instruments are jointly zero is 62.662 (significant at the 1% level), which is in excess of all the critical values from Table 5.2 of Stock and Yogo (2005), indicating that the chosen instrumental variables (i.e., lagged values of corporate governance factors and dividend payout ratio) are relevant and therefore there is no weak instruments problem.

Second, the Hansen (1982) test for over-identifying restrictions is used to check whether the instrumental variables satisfy the exclusion condition. The test results in the lower part of Table 7 reveal that the Hansen *J*-statistic, $\mathcal{X}^2(1)$, is 0.863 (p = 0.353), 0.023 (p = 0.880), 1.496 (p = 0.221), and 1.504 (p = 0.220) for ROA, ROE, Q and MBVE models, respectively. These results fail to disprove the null hypothesis that all instrumental variables are uncorrelated with the error term, which suggests that the selected instrumental variables are exogenous and valid. In addition, we also conduct the standard Hausman (1978) test to justify the employment of 2SLS estimation rather than panel regression estimation. The results of the Hausman *F*-statistic (F = 9.112, 6.718, 8.275 and 6.450 for ROA, ROE, Q and MBVE models, respectively, $p < 0.01$) strongly contradict the null hypothesis that the endogenous regressors are exogenous, which implies that the panel regression estimates are biased and inconsistent, and thus indicates the need for, and the appropriateness of using, 2SLS estimation.

With regard to the results of 2SLS estimates, the second-stage firm performance equations are shown in columns 1–4 of Table 7. The signs of the coefficients on the independent and control variables in each equation are generally as predicted. In general, the 2SLS estimates are larger than those of panel regression estimation in Table 6.

Columns 1 and 2 of Table 7 provide the regression results based on accounting-based measures for ROA and ROE, respectively. As far as corporate characteristics variables are concerned, we find, consistent with Cho and Kim (2007), that the coefficient of INDBOD_R is positively correlated with ROA and ROE at the 1% significance level. Therefore, Hypothesis 1a is supported, suggesting that firm performance increases significantly after an increase in the proportion of independent directors, similar to the results of panel regression estimation. In addition, the coefficient of TIER is positively and significantly related to ROA and ROE at the 1% level, thus confirming Hypothesis 1b. The results are consistent with previous panel regression results, and show that firm performance is positively associated with a two-tier board structure.

Moreover, similar to the results of panel regression estimation, the coefficient of BODSIZE is negative and significant at the 1% level for both ROA and ROE. The results support Hypothesis 1c, indicating that board size is inversely associated with firm performance, which is in line with the studies of Mak and Kusnadi (2005) and Guest (2009). Furthermore, we observe that the coefficient of DUALITY is negatively and significantly related to both ROA and ROE at the 5% and 10% level, respectively. Therefore, Hypothesis 1d is accepted, suggesting that board leadership has a detrimental effect on firm performance, similar to the study of Cornett *et al.* (2008), and the results of panel regression models.

In terms of ownership structure variables, the coefficient of BLOCKOWN is positive for both ROA and ROE, but only significant at the 1% level in the case of ROA, thus partly confirming Hypothesis 2a. In addition, consistent with previous panel regression estimation results, each of the coefficients of INSTOWN, FOROWN, and FAMOWN is positive and significant at the

1% level for both ROA and ROE. These results support Hypotheses 2b-2d, suggesting that all institutional, foreign and family ownership has a direct impact on firm performance, consistent with Filatotchev *et al.* (2005), Cho and Kim (2007), and Andres (2008). Finally, with respect to control variables, we find that RD is significantly and negatively correlated with ROE but not with ROA. In addition, ROA and ROE are positively related to FIRMSIZEK, GROWTH, DPAYOUT and BIG4, but negatively to LEV, HHI and FIRMAGE.

The regression results based on market measures for Q and MBVE are shown in columns 3 and 4, respectively. With regard to board characteristics, similar to the results of panel regression estimation, we find that the coefficient of INDBOD_R is positively and significantly associated with both Q and MBVE at the 5% and 10% level, respectively. The results support Hypothesis 1a, suggesting that firm performance improves significantly with a higher proportion of independent directors, in line with those of Weir *et al.* (2002). Additionally, the coefficient of TIER is positively and significantly related to Q at least at the 5% level, but not significant for MBVE. Therefore, Hypothesis 2a is partly supported.

Moreover, we find, unlike the results of accounting measures and those of panel regression estimation, that both of the coefficients of BODSIZE and DUALITY are insignificant, suggesting that both the size of board of directors and CEO duality are irrelevant to the determinants of firm performance. Therefore, Hypotheses 1c and1d are not supported. These results are similar to those of Kumar and Singh (2012), Drakos and Bekiris (2010), and Kiel and Nicholson (2003), but partly contradict the findings of Young *et al.* (2008).

With regard to ownership structure variables, consistent with the results of accounting measures and those of panel regression estimation, each of the coefficients of BLOCKOWN, INSTOWN, FOROWN, and FAMOWN is positive and significant at the 1% level for both Q and MBVE. Thus all Hypotheses 2a-2d are supported again, implying that firm performance is positively affected by institutional, foreign, family and block-holders' ownership, consistent with Maury (2006), Omran *et al.* (2008), and Villalonga and Amit (2006). Finally, as regards control variables, the present study observes that GROWTH, DPAYOUT, BIG4 and RD are positively associated with both Q and MBVE, whereas FIRMSIZE, LEV, HHI and FIRMAGE are negatively related to Q and MBVE models.

[insert Table 7 here]

6. Conclusion

This paper assesses the impact of board characteristics, the internal corporate governance mechanism, and ownership structure, the external corporate governance mechanism, on firm performance. In contrast to prior evidence on western developed countries that show no linkage between independent directors and firm performance, our findings indicate that for both accounting-based measures and market-based measures, board independence has a significant and positive effect on firm performance in our study on Taiwanese firms. In addition, according to the Taiwanese context, we observe that firms with a two-tier board structure, composed of board of directors and supervisors, perform better than those with a one-tier board system. We also find that firm performance is positively related to block-holders' ownership, institutional ownership, foreign ownership and family ownership. In contrast, consistent with agency theory arguing that larger board and CEO duality are ineffective in monitoring the firm due to a free rider problem and failure of internal control mechanisms (Jensen, 1993; Lipton and Lorsch,

1992), our evidence points out that board size and the separation between chairman and CEO are negatively associated with firm performance in the context of Taiwan.

Our findings have the following main implications. In contrast to the inconclusive empirical results on the impact of independent boards on firm performance in developed markets such as the UK, the findings of the current study, which show a significantly positive association between appointment of independent directors and firm performance, imply that the monitoring value of independent directors tends to be more significant in markets with weaker corporate governance mechanisms. Therefore, the corporate governance reform regarding the independent director system which is mandatory for newly-listed companies is a successful policy in Taiwan. However, we suggest that the regulatory authority should require all listed companies to appoint independent directors to further enhance the Taiwanese corporate governance.

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Table 1 Sample Selection Process

	Firm-year observations
Preliminary sample size (1997–2015)	12,680
Less:	
Observations in the financial sector	645
Observations in depository receipts sector	186
Observations listed less than one year or observations with incomplete data regarding corporate governance information	625
Outliers	1,073
Full sample size	10,151

Table 2 Definition of the Research Variables

Variables	Acronym	Definition	Expected sign
Dependent variables			
Return on assets	ROA	The ratio of earnings before interest and taxes over the book value of average total assets.	
Return on equity	ROE	The ratio of net income over the book value of average total equity.	
Tobin's Q	Q	The ratio of the sum of the market value of common shares and the book value of total debt over the book value of total assets.	
Market-to-book value of equity	MBVE	The market value of equity over the book value of equity.	
Board characteristics variables			
The proportion of independent directors	INDBOD_R	The proportion of independent directors over the total number of directors on the board.	+
Board structure	TIER	A dummy variable, which equals 1 if the firm's board structure is a two-tier system, and 0 otherwise.	+
Board size	BODSIZE	The total number of directors on the board.	−
Board leadership	DUALITY	A dummy variable, which equals 1 if the CEO is also the chairman of the board of directors, and 0 otherwise.	−
Ownership structure variables			
Block-holders' ownership	BLOCKOWN	The proportion of shares owned by the ten largest outside shareholders or shareholders who hold at least 5% of shares outstanding.	+
Institutional ownership	INSTOWN	The proportion of shares owned by institutional shareholders.	+
Foreign ownership	FOROWN	The proportion of shares owned by foreign shareholders.	+
Family ownership	FAMOWN	The proportion of shares owned by family members and other legal entities that are controlled by family members.	+
Control variables			
Firm size	FIRMSIZE	The natural logarithm of the book value of total assets.	?
Growth opportunity	GROWTH	The ratio of current year sales minus prior year sales over prior year sales.	+
Leverage	LEV	The ratio of total debt to total assets.	−
Dividend payout ratio	DAPYOUT	The ratio of cash dividend per share to earnings per share.	?
Product market competition	HHI	The sum of the squares of the market share for each firm in the industry in each year.	?
Firm age	FIRMAGE	The number of years that a firm has operated.	−
Big-4 audit firm	BIG4	A dummy variable, which equals 1 if the firm's auditor is a Big-4 audit firm and 0 otherwise.	+
R&D ratio	RD	The ratio of R&D expenditure to total sales.	?

Table 3 Descriptive Statistics

Variables	Min.	25%	Mean	Median	75%	Max.	SD
Dependent variables							
ROA (%)	-22.870	1.730	5.255	5.080	9.230	27.410	7.105
ROE (%)	-61.860	2.000	7.180	7.570	14.260	41.060	12.295
Q	0.191	0.904	1.336	1.132	1.532	10.315	0.719
MBVE	0.000	0.831	1.516	1.228	1.854	14.612	1.088
Board characteristics variables							
INDBOD_R (%)	0.000	0.000	7.738	0.000	18.182	62.500	11.761
TIER	0.000	1.000	0.957	1.000	1.000	1.000	0.204
BODSIZE	5.000	8.000	9.686	9.000	11.000	22.000	2.714
DUALITY	0.000	0.000	0.278	0.000	1.000	1.000	0.448
Ownership structure variables							
BLOCKOWN (%)	0.000	10.070	18.214	16.570	24.290	79.810	11.630
INSTOWN (%)	0.000	0.000	2.160	0.370	2.870	62.260	3.706
FOROWN (%)	0.000	0.720	9.006	4.070	11.460	92.850	12.560
FAMOWN (%)	0.000	14.490	28.576	27.060	40.090	95.560	17.514
Control variables							
FIRMSIZE	11.895	14.922	15.788	15.613	16.412	21.675	1.252
GROWTH (%)	-67.330	-8.030	6.310	3.170	16.290	176.380	26.801
LEV (%)	5.450	25.550	37.387	36.960	48.190	81.250	15.620
DPAYOUT (%)	0.000	0.000	40.776	40.269	71.250	200.000	37.471
HHI	0.039	0.061	0.150	0.082	0.203	0.931	0.144
FIRMAGE	2.137	19.512	29.389	28.504	38.101	69.715	12.696
BIG4	0.000	1.000	0.850	1.000	1.000	1.000	0.357
RD (%)	0.000	0.000	2.239	0.910	2.940	23.800	3.465

Notes: N = 10,151. The definitions of the research variables are as follows. ROA is the ratio of earnings before interest and taxes over the book value of average total assets; ROE is the ratio of net income over the book value of average total equity; Q is the ratio of the sum of the market value of common shares and the book value of total debt over the book value of total assets; MBVE is the market value of equity over the book value of equity; INDBOD_R is the proportion of independent directors over the total number of directors on the board; TIER is a dummy variable, which equals 1 if the firm's board structure is a two-tier system, and 0 otherwise; BODSIZE is the total number of directors on the board; DUALITY is a dummy variable, which equals 1 if the CEO is also the chairman of the board of directors, and 0 otherwise; BLOCKOWN is the proportion of shares owned by the ten largest outside shareholders or shareholders who hold at least 5% of shares outstanding; INSTOWN is the proportion of shares owned by institutional shareholders; FOROWN is the proportion of shares owned by foreign shareholders; FAMOWN is the proportion of shares owned by family members and other legal entities that are controlled by family members; FIRMSIZE is the natural logarithm of the book value of total assets; GROWTH is the ratio of current year sales minus prior year sales over prior year sales; LEV is the ratio of total debt to total assets; DPAYOUT is the ratio of cash dividend per share to earnings per share; HHI is the sum of the squares of the market share for each firm in the industry in each year (Herfindahl-Hirschman Index); FIRMAGE is the number of years that the firm has operated; BIG4 is a dummy variable, which equals 1 if the firm is audited by Big-4 accounting firms, and 0 otherwise; RD is the ratio of R&D expenditure to total sales. For the dummy (binary) variables, the mean indicates the proportion of sample firms with value equal to 1 for the variable.

Table 4 Yearly Mean Values of The Research Variables

Variables	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Dependent variables																			
ROA	6.769	4.234	4.386	4.768	3.607	4.467	5.838	6.387	5.379	6.662	7.158	3.666	5.385	6.819	5.138	4.271	4.648	5.125	4.645
ROE	9.020	4.411	4.514	5.294	3.281	5.136	8.226	9.575	7.613	9.584	10.352	4.411	7.508	9.919	7.481	5.921	6.561	7.485	6.679
Q	1.943	1.596	1.568	1.029	1.263	1.173	1.337	1.229	1.263	1.445	1.428	0.956	1.584	1.514	1.165	1.277	1.392	1.393	1.263
MBVE	2.492	1.930	1.887	1.017	1.379	1.263	1.551	1.368	1.413	1.693	1.643	0.914	1.859	1.793	1.256	1.422	1.614	1.600	1.405
Board characteristics variables																			
INDBOD_R	N/A	N/A	N/A	N/A	N/A	2.251	4.875	6.733	7.695	7.883	7.537	7.701	8.038	8.080	9.090	11.021	12.297	13.558	18.244
TIER	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	0.992	0.982	0.972	0.970	0.954	0.918	0.891	0.865	0.792
BODSIZE	10.498	10.087	9.916	9.626	9.648	9.588	9.591	9.730	9.708	9.768	9.702	9.723	9.668	9.620	9.626	9.633	9.569	9.537	9.592
DUALITY	0.211	0.229	0.237	0.297	0.285	0.284	0.294	0.295	0.281	0.290	0.278	0.289	0.265	0.264	0.271	0.280	0.281	0.280	0.293
Ownership structure variables																			
BLOCKOWN	9.909	11.000	11.838	13.200	13.576	14.733	17.650	16.596	17.470	17.628	18.824	19.229	19.623	19.341	20.523	21.042	21.765	21.915	22.356
INSTOWN	1.723	1.775	1.840	1.580	1.543	1.734	1.548	1.708	1.876	1.871	2.226	2.219	2.183	2.054	2.141	2.359	2.770	3.099	3.231
FOROWN	8.797	6.625	5.429	5.292	4.859	5.419	5.694	8.173	8.629	9.806	10.716	10.637	8.791	9.793	10.097	10.669	10.963	11.220	11.612
FAMOWN	26.027	26.508	27.320	29.275	29.112	29.037	29.285	28.015	27.837	27.490	27.904	28.317	29.063	28.758	28.856	29.184	29.061	29.303	29.495
Control variables																			
FIRMSIZE	15.816	15.826	15.768	15.684	15.645	15.617	15.606	15.640	15.672	15.725	15.816	15.743	15.776	15.864	15.862	15.899	15.912	15.944	15.957
GROWTH	14.639	9.815	8.919	15.718	-4.058	12.966	14.434	19.512	6.572	9.264	9.909	-0.481	-9.339	23.501	1.619	-0.058	1.506	3.709	-3.629
LEV	37.191	37.406	39.008	40.413	40.305	40.696	41.006	40.676	39.138	37.193	36.252	35.949	34.512	35.147	35.992	35.788	36.287	35.913	36.320
DAPYOUT	8.487	19.564	16.973	21.142	26.582	30.965	33.255	35.971	38.680	45.380	44.244	37.960	51.156	49.384	48.457	48.739	51.261	53.129	51.335
HHI	0.154	0.158	0.212	0.214	0.170	0.133	0.133	0.144	0.145	0.140	0.145	0.152	0.135	0.135	0.149	0.148	0.142	0.146	0.149
FIRMAGE	26.254	26.573	26.633	26.330	26.094	26.241	26.055	26.493	27.127	27.968	28.664	28.902	29.788	30.847	31.452	32.282	32.819	33.548	34.214
BIG4	0.789	0.793	0.797	0.810	0.813	0.821	0.834	0.849	0.845	0.851	0.856	0.864	0.852	0.855	0.867	0.875	0.870	0.878	0.890
RD	1.225	1.410	1.403	1.413	1.808	1.945	2.090	2.083	2.138	2.195	2.180	2.407	2.557	2.411	2.498	2.703	2.707	2.560	2.623
N	247	275	320	374	432	476	541	562	569	582	598	610	615	626	652	649	652	689	682

Notes: The definitions of the research variables are the same as in Table 3. For the dummy (binary) variables, the mean indicates the proportion of sample firms with value equal to 1 for the variable.

Table 5 Variance Inflation Factor and Pearson Correlation Matrix

	Variables	VIFs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	INDBOD_R	1.60	1														
2	TIER	1.42	-0.512[a]	1													
3	BODASIZE	1.18	-0.006	0.041[a]	1												
4	DUALITY	1.05	-0.009	0.044[a]	-0.151[a]	1											
5	BLOCKOWN	1.33	0.072[a]	-0.038[a]	-0.143[a]	0.006	1										
6	INSTOWN	1.17	0.135[a]	-0.123[a]	0.116[a]	-0.038[a]	0.075[a]	1									
7	FOROWN	1.56	0.141[a]	-0.155[a]	0.135[a]	-0.050[a]	0.102[a]	0.258[a]	1								
8	FAMOWN	1.32	-0.053[a]	0.024[b]	-0.067[a]	-0.074[a]	0.390[a]	-0.093[a]	-0.153[a]	1							
9	FIRMSIZE	1.78	0.049[a]	-0.161[a]	0.300[a]	-0.131[a]	-0.052[a]	0.301[a]	0.513[a]	-0.070[a]	1						
10	GROWTH	1.04	-0.029[a]	0.052[a]	-0.003	0.006	-0.044[a]	0.025[b]	0.015	-0.048[a]	0.051[a]	1					
11	LEV	1.23	-0.056[a]	0.020[b]	-0.003	-0.010	0.012	-0.044[a]	-0.066[a]	0.013	0.185[a]	0.075[a]	1				
12	DPAYOUT	1.15	0.159[a]	-0.065[a]	0.085[a]	-0.049[a]	0.086[a]	0.154[a]	0.180[a]	0.037[a]	0.093[a]	-0.013	-0.237[a]	1			
13	HHI	1.23	-0.232[a]	0.059[a]	0.126[a]	-0.076[a]	0.048[a]	-0.017[c]	-0.067[a]	0.175[a]	0.062[a]	-0.048[a]	0.027[a]	0.000	1		
14	FIRMAGE	1.33	-0.262[a]	0.082[a]	0.118[a]	-0.045[a]	0.155[a]	0.004	0.027[a]	0.143[a]	0.140[a]	-0.120[a]	0.004	0.056[a]	0.314[a]	1	
15	BIG4	1.10	0.147[a]	-0.054[a]	0.041[a]	-0.035[a]	-0.005	0.107[a]	0.161[a]	-0.034[a]	0.132[a]	0.013	-0.076[a]	0.094[a]	-0.140a	-0.157[a]	1
16	RD	1.29	0.235[a]	-0.097[a]	-0.057[a]	0.051[a]	-0.084[a]	0.042[a]	0.069[a]	-0.209[a]	-0.09[a]	-0.034[a]	-0.250[a]	0.066[a]	-0.277[a]	-0.297[a]	0.129[a]

Notes: N = 10,151. The definitions of the research variables are the same as in Table 3. [a] Significant at the 0.01 level. [b] Significant at the 0.05 level. [c] Significant at the 0.10 level.

Table 6 Fixed Effects Regression Results of Firm Performance on Board Characteristics, Ownership Structure and Control Variables

Independent Variables	Expected Sign	Accounting-based Performance		Market-based Performance	
		ROA	ROE	Q	MBVE
Constant	?	4.039	2.808	3.849***	5.624***
		(2.547)	(4.492)	(0.271)	(0.412)
INDBOD_R	+	0.045***	0.083***	0.002***	0.003***
		(0.007)	(0.012)	(0.001)	(0.001)
TIER	+	2.622***	4.465***	0.095***	0.117**
		(0.337)	(0.594)	(0.036)	(0.054)
BODSIZE	−	-0.066***	-0.126***	0.006**	0.008**
		(0.023)	(0.041)	(0.002)	(0.004)
DUALITY	−	-0.397***	-0.753***	-0.027*	-0.035*
		(0.129)	(0.228)	(0.014)	(0.021)
BLOCKOWN	+	0.011*	0.002	0.003***	0.004***
		(0.006)	(0.010)	(0.001)	(0.001)
INSTOWN	+	0.147***	0.204***	0.009***	0.014***
		(0.017)	(0.029)	(0.002)	(0.003)
FOROWN	+	0.072***	0.117***	0.013***	0.021***
		(0.006)	(0.010)	(0.001)	(0.001)
FAMOWN	+	0.023***	0.042***	0.003***	0.005***
		(0.004)	(0.007)	(0.000)	(0.001)
FIRMSIZE	?	0.254***	0.462***	-0.053***	-0.084***
		(0.063)	(0.111)	(0.007)	(0.010)
GROWTH	+	0.080***	0.144***	0.005***	0.008***
		(0.002)	(0.004)	(0.000)	(0.000)
LEV	−	-0.107***	-0.134***	-0.004***	0.000
		(0.004)	(0.007)	(0.000)	(0.001)
DPAYOUT	?	0.058***	0.101***	0.001***	0.002***
		(0.002)	(0.003)	(0.000)	(0.000)
HHI	?	-2.697***	-5.104***	-0.268***	-0.428***
		(0.508)	(0.896)	(0.054)	(0.082)
FIRMAGE	−	-0.055***	-0.082***	-0.007***	-0.010***
		(0.006)	(0.010)	(0.001)	(0.001)
BIG4	+	0.541***	1.341***	0.026	0.072***
		(0.166)	(0.293)	(0.018)	(0.027)
RD	?	0.018	-0.093***	0.033***	0.044***
		(0.020)	(0.034)	(0.002)	(0.003)
Industry		Yes	Yes	Yes	Yes
Year		Yes	Yes	Yes	Yes
Adjusted R^2		0.359	0.335	0.294	0.286
Model *F*		133.286***	119.713***	99.372***	95.356***

*Notes: N = 10,151. The definitions of the research variables are the same as in Table 3. The values in parentheses are robust standard errors. * Significant at the 0.01 level. ** Significant at the 0.05 level. *** Significant at the 0.10 level.*

Table 7 2SLS Regression Results of Firm Performance on Board Characteristics, Ownership Structure and Control Variables

Independent Variables	Expected Sign	Accounting-based Performance		Market-based Performance	
		ROA	ROE	Q	MBVE
Constant	?	-4.612**	-10.030**	2.691***	3.928***
		(2.318)	(4.225)	(0.169)	(0.286)
INDBOD_R	+	0.045***	0.084***	0.002**	0.002*
		(0.008)	(0.014)	(0.001)	(0.001)
TIER	+	2.989***	5.089***	0.120**	0.137
		(0.462)	(0.769)	(0.055)	(0.087)
BODSIZE	−	-0.097***	-0.185***	0.003	0.003
		(0.024)	(0.044)	(0.002)	(0.004)
DUALITY	−	-0.324**	-0.558*	-0.022	-0.031
		(0.164)	(0.286)	(0.016)	(0.024)
BLOCKOWN	+	0.026***	0.022	0.005***	0.007***
		(0.008)	(0.014)	(0.001)	(0.001)
INSTOWN	+	0.117***	0.145***	0.006***	0.009***
		(0.022)	(0.041)	(0.002)	(0.003)
FOROWN	+	0.052***	0.086***	0.012***	0.019***
		(0.007)	(0.012)	(0.001)	(0.001)
FAMOWN	+	0.021***	0.039***	0.003***	0.005***
		(0.004)	(0.008)	(0.000)	(0.001)
FIRMSIZE	?	0.506***	0.885***	-0.035***	-0.059***
		(0.073)	(0.130)	(0.007)	(0.011)
GROWTH	+	0.080***	0.144***	0.005***	0.008***
		(0.003)	(0.006)	(0.000)	(0.000)
LEV	−	-0.107***	-0.139***	-0.004***	0.000
		(0.004)	(0.009)	(0.000)	(0.001)
DPAYOUT	?	0.059***	0.104***	0.001***	0.002***
		(0.002)	(0.003)	(0.000)	(0.000)
HHI	?	-2.542***	-4.792***	-0.249***	-0.400***
		(0.453)	(0.845)	(0.040)	(0.061)
FIRMAGE	−	-0.054***	-0.081***	-0.007***	-0.010***
		(0.006)	(0.011)	(0.001)	(0.001)
BIG4	+	0.561***	1.411***	0.030**	0.082***
		(0.163)	(0.319)	(0.013)	(0.021)
RD	?	0.025	-0.084**	0.033***	0.044***
		(0.023)	(0.036)	(0.003)	(0.003)
Industry		Yes	Yes	Yes	Yes
Year		Yes	Yes	Yes	Yes
Adjusted R^2		0.364	0.343	0.286	0.279
Model *F*		102.382***	82.887***	67.267***	68.649***
Cragg-Donald *F*-Statistic		62.662***	62.662***	62.662***	62.662***
Hansen *J*-statistic		0.863	0.023	1.496	1.504
		(p=0.353)	(p=0.880)	(p=0.221)	(p=0.220)
Hausman *F*-statistic		9.112***	6.718***	8.275***	6.450***

*Notes: N = 9,431. The definitions of the research variables are the same as in Table 3. The values in parentheses are robust standard errors. * Significant at the 0.01 level. ** Significant at the 0.05 level. *** Significant at the 0.10 level.*